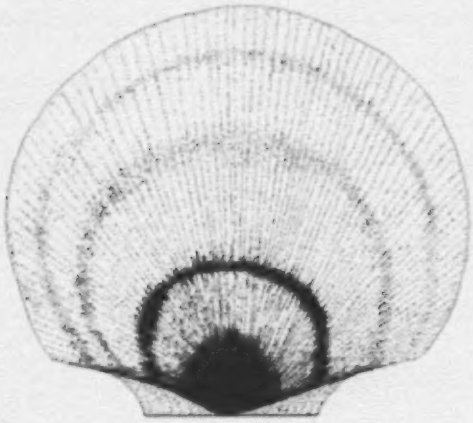
Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Newfoundland and Labrador Region

Canadian Science Advisory Secretariat
Science Advisory Report 2016/032

# AN ASSESSMENT OF SEA SCALLOP ON THE ST. PIERRE BANK (SUBDIVISION 3PS)



*Sea Scallop (Placopecten magellanicus)*

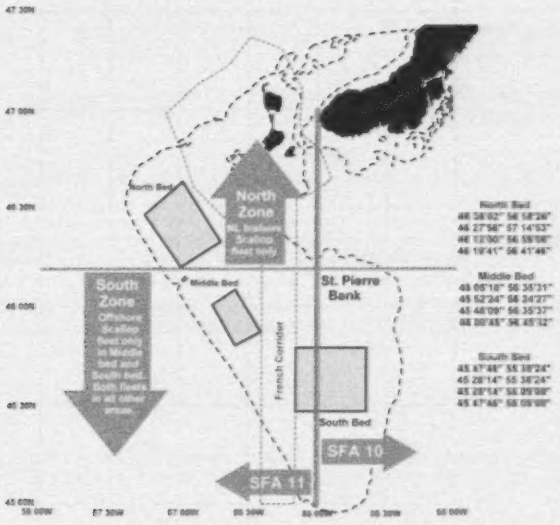



*Figure 1: St. Pierre Bank showing the three main Sea Scallop beds, the Hooley recommended fleet separation zones and Scallop Fishing Areas (SFA) 10 and 11.*

## Context:

*The directed fishery for Sea Scallops (Placopecten magellanicus) started on the St. Pierre Bank in the late 1970s. Populations on St. Pierre Bank are mainly found in three beds at depths of 40-100 m (Fig. 1). They are usually found on hard bottom, with variable substrate composition, consisting largely of sand, gravel, shell fragments, and stones. The Sea and Iceland Scallop distributions overlap to varying degrees with complete overlap in the Middle bed, and a high degree of overlap in the North bed. A large area in the southern portion of the South bed, with a sandy substrate, is inhabited only by Sea Scallops.*

*Prior to 2006 the fishery was managed by a Total Allowable Catch (TAC), and meat count regulations applied to the offshore fleet, but not to the inshore fleet. In 2006, following the recommendations of the Hooley Report (Hooley 2005), specific fishing areas and TACs were applied to each fleet (Fig. 1). Since then the offshore fleet has not fished on the St. Pierre Bank and fishing has been prosecuted exclusively in the North bed by the NL inshore fleet.*

*A Canadian research vessel survey for Sea Scallops on the St. Pierre Bank (Subdiv. 3Ps) was completed in September, 2015. A Regional Peer Review meeting was held February 22, 2016 in St. John's, NL to assess the status of the Sea Scallop on the St. Pierre Bank. Participants included DFO scientists and fisheries managers, and representatives from industry and the Provincial and Nunatsiavut governments.*

## SUMMARY


- **Landings** since 2012 have averaged 1,125 t shell stock (136 t meat weight).
- Minimum dredgeable (Research Vessel) **biomass** (MDB) estimate has decreased from 7,500 t in 2010 to 5,912 t in 2015, mainly due to a reduction in the North bed where it decreased by 56% in 2015.
- The **abundance** is currently dominated by a modal group of scallops (110 mm) in the South bed and North bed.
- The **natural mortality** index for Sea Scallop has increased from 0.09 in 2010 to 0.13 in 2015.
- **Recruitment** prospects are unknown.


## INTRODUCTION

### Species Biology

The Sea Scallop (*Placopecten magellenicus*) is confined to the Northwest Atlantic, and ranges from the Northern Gulf of St. Lawrence to Cape Hatteras, North Carolina. It is normally found in waters between depths of 10-100 m. Fishable aggregations are found from the Virginia Capes to Port au Port Bay, Newfoundland and Labrador (NL) with Georges Bank off Nova Scotia being the world's largest producer of Sea Scallops. The Sea Scallop fishery on the St. Pierre Bank is a pulse fishery, largely dependent on sporadic settlement and subsequent recruitment; they begin to recruit to the fishery at about age 4 (~ 90 mm). Sea Scallops are found on highly variable substrates. On St. Pierre Bank, they are generally found on fine and coarse sand, gravel, small rocks and shell fragments. The Sea Scallop is a filter-feeder, consuming plankton and detritus, and is associated with areas of strong currents. Unlike many species of scallops, this species is gonochoric, having one of two distinct sexes for its lifetime. Sea Scallops can become sexually mature as early as age 1 but their first spawning does not occur until their second year at a shell height ranging from 23-75 mm. Spawning in Newfoundland waters begins in July and may be initiated by changes in temperature, food supply and current speed. Eggs are externally fertilized and larvae are planktonic for 35 - 45 days before settling to the bottom, possibly at considerable distances from the spawning adults, depending on currents. Sea Scallops have been known to live up to 21 years. Adults commonly reach shell heights between 100-150 mm, but have been found at sizes greater than 200 mm.

### The Fishery

Annual landings of Sea Scallop from the St. Pierre Bank have been highly variable (Fig. 2), as is typical of 'pulse'-type fisheries. Directed fishing started in the late 1970s and landings peaked twice in the 1980s, at 6,000 tonnes round weight (t) in 1982 and 10,000 t in 1988. Landings declined through the early 1990s and removals were less than 500 t until 2003. Landings peaked again in 2004 and 2005 at ~ 4,500 t and 2,400 t respectively. Between 2005 and 2010 landings ranged from 300 t to 770 t then increased to 1,190 t in 2012, and since then has averaged 1,125 t shell stock (136 t meat weight). The conversion factor for sea scallop from round weight to meat weight is 8.3.

Prior to 2006 the fishery was managed by a Total Allowable Catch (TAC), and meat count regulations applied to the offshore fleet, but not to the inshore fleet. Following the release of the Hooley report (Hooley 2005) in 2006, fishing areas were assigned based on three known fishing beds on the St. Pierre Bank (Fig. 1). Since 2006 the offshore fleet has not fished on the St. Pierre Bank and fishing has only been taking place on the North bed by NL inshore vessels.

In 2015 the TAC for the inshore fleet was 1,121 t (round) (135 t meat weight) and the offshore fleet was allocated 50 t (meat weight).

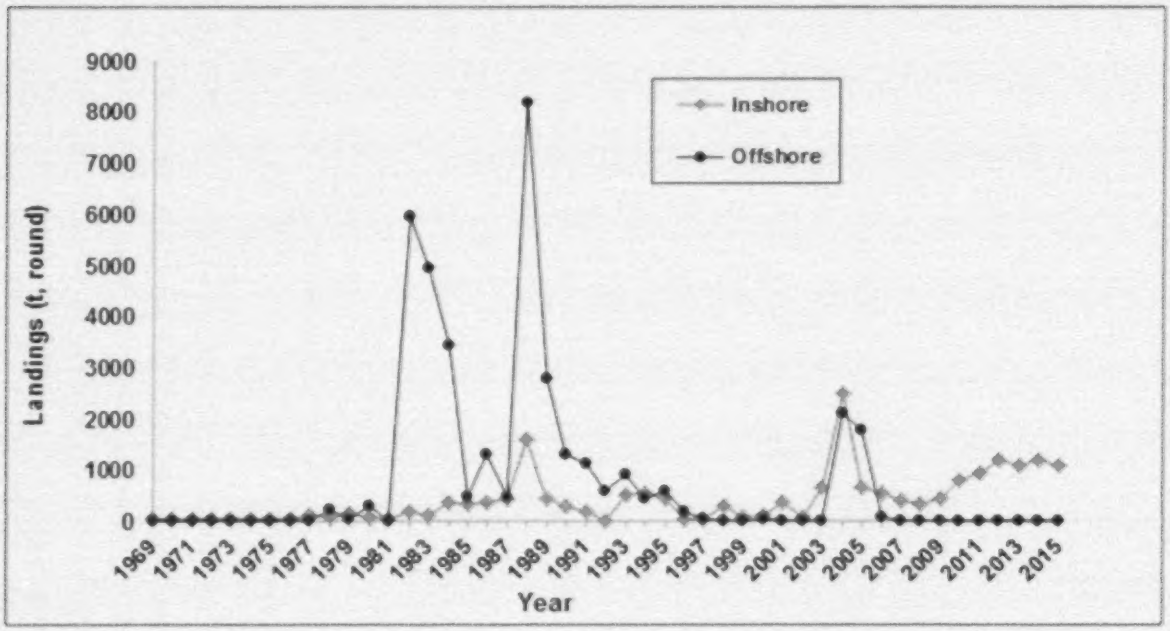



*Figure 2: Sea Scallop removals (t, round) from the three main beds on the St. Pierre Bank by inshore and offshore fleets.*

## ASSESSMENT

### Research Vessel Surveys

Resource assessment surveys were conducted by DFO in 2003 using the *CCGS Wilfred Templeman* and in 2010 and 2015 using the *CCGS Alfred Needler* following a stratified random sampling scheme. Stratification was based on beds (Fig. 3). Sets were optimally allocated in proportion to stratum-specific area and variance of the catch rates from the 2003 survey. Biomass (MDB - minimum dredgeable biomass) was derived by STRAP (Smith and Somerton, 1981) from swept area estimates within survey strata. From 2004 to 2006 the offshore fleet, using the vessel *Cape Keltic*, conducted similar surveys.

An 8 ft. New Bedford scallop dredge equipped with 3" rings and interconnected with a 2-top and 3-bottom link configuration was used in all surveys. Standard tow length for the DFO surveys was 0.5 nmi whereas the *Cape Keltic* surveys used 0.5 nmi. tow length. Upon completion of each tow (set) empty scallop shells with non-disarticulated valves ("cluckers") and live scallops were sorted by species. Total catches were enumerated and weighed by species. Biomass estimates were inflated by inclusion of epibionts in the catch weight. However, this bias did not affect trends in biomass. Shell height of scallops was determined from each set based on either the total catch or a sub-sample. In addition, for the DFO surveys, samples were collected from at least one set in each stratum to determine biological meat yield (number of meats per 500 g) and sea stars were measured and enumerated. Individual shell height and meat weight information was also collected in each bed in 2010 and 2015.

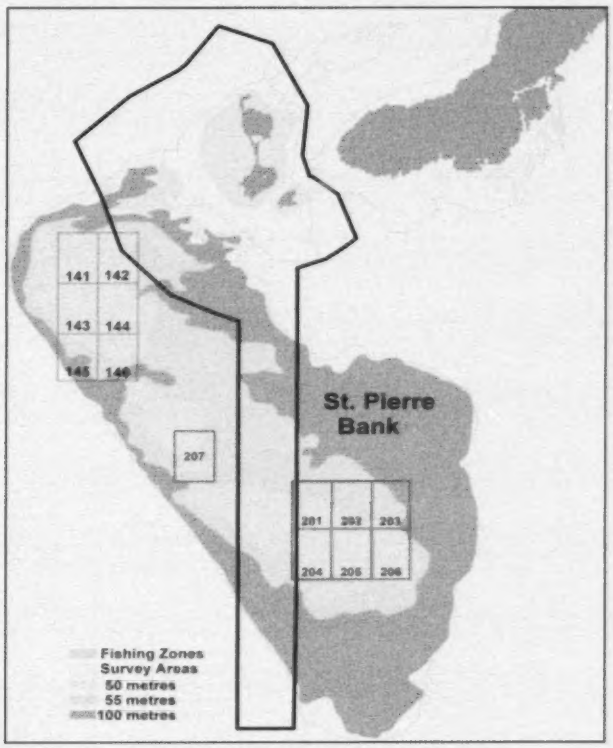



*Figure 3: Stratification scheme used in the 2015 DFO survey.*

## Biomass

A DFO research vessel survey in September 2015 resulted in a MDB estimate of 5,912 t (shell stock), the lowest since 2005 (Fig. 4). The South bed constituted 60% of the MDB with 31% in the North bed and only 9% in the Middle bed. The reduction in overall biomass since 2010 was mainly due to a reduction (56%) in the North bed. The biomass increased slightly from 329 t to 516 t in the Middle bed and from 3,024 t to 3,575 t in the South bed.

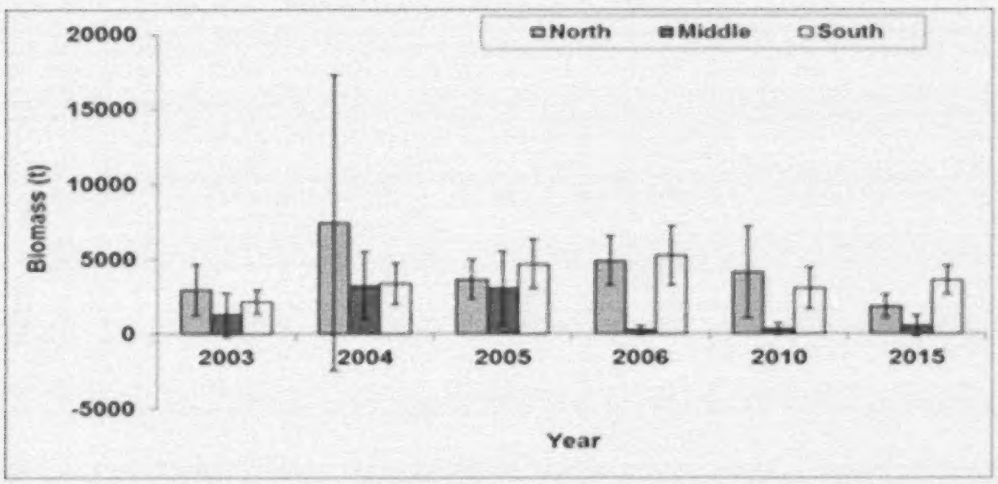



*Figure 4: Minimum dredgeable biomass estimates for the three main beds on the St. Pierre Bank from 2003 to 2015.*

In 2010 the abundance was dominated by a modal group of larger scallops (130 mm) with a secondary mode of smaller recently recruited scallops (90 mm). The modal group has since decreased to 110 mm in 2015 (Fig. 5). This mode is evident in the North and South beds and is also reflected in the higher meat counts (specifically in the North bed), which increased from 22/500 g to 28/500 g. However in the South bed the meat counts stayed the same at 16/500 g. An analysis of meat weight at shell height showed heavier meats for a given size in the South bed.

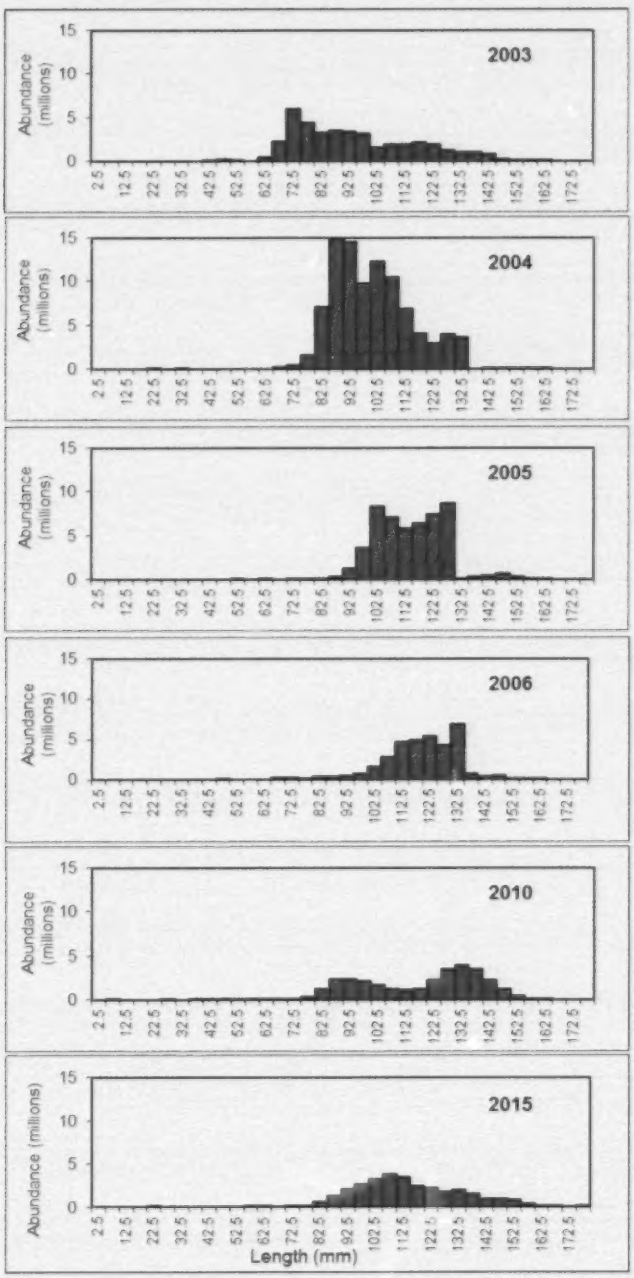



*Figure 5: Size Structure (length frequency (5 mm) groupings) of Sea Scallops sampled in research surveys on all three beds on the St. Pierre Bank from 2003-06 and 2010, 2015.*

### Recruitment

Recruitment is measured by the abundance of scallop < 90 mm, which has been low since 2004. Future recruitment prospects are unknown.

### Mortality

The **natural mortality** index (computed from the ratio of cluckers to live scallops) increased from 0.09 in 2010 to 0.13 in 2015. This low level is associated with low biomass of predatory sea stars.

### Sources of Uncertainty

The most recent resource assessment survey in September 2015 had incidences where the dredge warp-to-depth ratio of 3 to 1 (which is outlined in the scallop survey protocol) was not consistently followed. The warp-to-depth ratio varied from 2.9:1 to 3.6:1. A change in warp-to-depth ratio can affect the pitch angle of the dredge however it is unknown how this would affect the efficiency of the dredge.

The conversion factor of 8.3, which is used to convert round weight of sea scallops to meat weight, may be subject to spatial and temporal variability.

## CONCLUSIONS AND ADVICE

The minimum dredgeable biomass estimate from the 2015 survey was 5,912 t (shell stock), the lowest since 2005. The resource has decreased by 56% since 2010 in the North bed where the only fishing activity is taking place. The mode in shell height in all three beds combined on the St. Pierre Bank has decreased from 130 mm in 2010 to 110 mm in 2015. Recruitment appears to have been relatively low since 2004. Recruitment prospects are unknown.

## SOURCES OF INFORMATION

This Science Advisory Report is from the Regional Peer Review Meeting of February 22, 2016 on the Sea Scallop Assessment on St. Pierre Bank. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

DFO. 2007. Sea Scallop Status on St. Pierre Bank. DFO Can. Sci. Advis. Sec. Sci. Resp. 2007/006.

DFO. 2011. An assessment of Sea Scallop on the St. Pierre Bank (Subdivision 3Ps). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2011/042.

Hennen, D. R. and D. R. Hart. 2012. Shell Height to Weight Relationships for Atlantic Sea Scallops (*Placopecten magellanicus)* in Offshore U.S. Waters, Journal of Shellfish Research, Vol. 31, No. 4, 1133-1144.

Hooley, D. W. 2005. Independent Process to Examine the Allocation of Sea Scallop Quota on St. Pierre Bank (3Ps) by David W. Hooley Commissioned at the direction of the Minister of Fisheries and Oceans, the Honourable Geoff Regan.

Naidu, K.S. 1988. Estimating Mortality Rates in the Iceland Scallop, (*Chlamys islandica* O.F. Muller) Journal of Shellfish Research, Vol. 7, No. 1, 61-71.

Naidu, K. S. and J. T. Anderson. 1984. Aspects of scallop recruitment on St. Pierre Bank in relation to oceanography and implications for resource management. CAFSAC Res. Doc. 84/29, 15 p.

Naidu, K. S., F. M. Cahill and E. M. Seward. 2001. The scallop fishery in Newfoundland and Labrador becomes beleaguered. DFO Can. Sci. Advis. Sec. Res. Doc. 2001/064. 35 p.

Smith, S. J. and G. D. Somerton. 1981. STRAP: A user-oriented computer analysis system for groundfish research trawl survey data. Can.Tech. Rep. Fish. Aquat. Sci. 1030: iv + 66p.

## THIS REPORT IS AVAILABLE FROM THE:

Center for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO Box 5667
St. John's, NL A1C 5X1

Telephone: 709-772-3332
E-Mail: DFONLCentreforScienceAdvice@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-5087
© Her Majesty the Queen in Right of Canada, 2016

Correct Citation for this Publication:

DFO. 2016. An Assessment of Sea Scallop on the St. Pierre Bank (Subdivision 3Ps). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/032.

*Aussi disponible en français :*

*MPO. 2016. Évaluation du pétoncle géant dans le banc de Saint-Pierre (sous-division 3Ps). Secr. can. de consult. scient. du MPO. Avis sci. 2016/032.*